

Title: Go for the Badge!

Brief Overview:

In this learning unit, students will complete tasks involving fractions and decimals to earn badges in the last phase of a coed scout program. The activities include estimating and measuring distances in a long jump for the P.E. Badge, converting recipes and cooking for the Culinary Badge, and creating a badge using pattern blocks. The unit will end with a performance assessment. In this assessment, students will convert fractions to decimals, use data from a table to construct a graph, and add/multiply decimals.

Links to NCTM 2000 Standards:

- **Standard 1: Numbers and Operations**
Mathematics instructional programs should foster the development of number and operation sense so that all students use computational tools and strategies fluently and estimate appropriately.
- **Standard 4: Measurement**
Mathematics instructional programs should include attention to measurement so that all students apply a variety of techniques, tools, and formulas for determining measurements.
- **Standard 5: Data Analysis, Statistics, and Probability**
Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students organize and represent data to answer those questions.
- **Standard 6: Problem Solving**
Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics.
- **Standard 7: Reasoning and Proof**
Mathematics instructional programs should focus on learning to reason and construct proofs as part of understanding mathematics so that all students recognize reasoning and proof as essential and powerful parts of mathematics.
- **Standard 8: Communication**
Mathematics instructional programs should use communication to foster an understanding of mathematics so that all students express mathematical ideas coherently and clearly to peers, teachers, and others.
- **Standard 9: Connections**
Mathematics instructional programs should emphasize connections to foster an understanding of mathematics so that all students recognize and use connections among different mathematical ideas.

- **Standard 10: Representation**

Mathematics instructional programs should emphasize mathematical representation to foster an understanding of mathematics so that all students create and use representations to organize, record, and communicate mathematical ideas.

Grade/Level:

Grades 4 - 5

Duration/Length:

4 - 6 days

Approximately 50 - 60 minutes per activity

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Estimating
- Constructing fractions
- Multiplying whole numbers and fractions
- Constructing graphs

Student Outcomes:

Students will:

- convert fractions to decimals.
- add/subtract fractions with like and unlike denominators.
- multiply fractions.
- estimate and round fractions and decimals.
- add/subtract decimals (money).
- use various measuring tools.

Materials/Resources/Printed Materials:

- Student Resource Sheet 1 (Long Jump)
- Measurement Strip (see Teacher Preparation-Activity 2)
- Calculators
- Student Resource Sheet 2 (Serving Up Fractions)
- Teacher Resource Sheet 1 (Recipe)
- Student Resource Sheet 3 (Design A Badge)
- Book - *Eating Fractions* by Bruce McMillan
- Student Resource Packet (Performance Assessment)
- Student Resource Sheets 4-8

- Teacher Resource Sheets 2-3
- Pattern Blocks
- Graph Paper
- Fraction Builders

Development/Procedures:

Activity One: Long Jump!

Teacher Preparation:

1. Use adding machine tape or cut strips of paper and tape the strips together end to end so that it measures 10 feet. Mark and label the strip by placing a O at the left and drawing a line every 1/4-inch until you reach 10 feet. You should have one strip for every four students. This strip will be referred to now as the *measuring strip*. Making the measuring strips is a good idea for parent volunteers.
2. Find an area outside to hold the Long Jump activity. Place each measuring strip on the ground. Remember to place the measuring strips far enough apart so that the students have enough room to move.
3. Duplicate a Long Jump Student Resource Sheet 1 for each student.

Anticipatory Set: Ask students how they could use fractions and decimals in Physical Education. Solicit responses and write them on the board. **Briefly** discuss each response. Inform the students that today, we will be involved in a physical education activity that incorporates fractions.

Procedures:

1. Show the class the measuring strip. Inform them that they will be using this as a measuring tool. Discuss how to read the measuring strip. Review fractions of 1/4 (one-fourth, one-half, three-fourths, one whole, etc.).
2. Tell the students that today they will practice long jumping. Let them know that later you will demonstrate how to long jump. Also, let them know that they will measure the distance they jumped and compare this data with a partner.
3. Distribute the Student Resource Sheet 1, Long Jump. Model for students how to complete the charts. Advise students that before they jump, they will estimate how far they think they can jump.
4. The students will be working with a partner; however, there will be two sets of students (four people) at each measuring strip. They have to take turns jumping. Pair students.

5. Take the students outside to the pre-arranged area for jumping. Demonstrate how you want them to jump. You may want to have a starting point marked.
6. Allow them to have a few practice jumps.
7. When you feel they have had enough time practicing, instruct them to begin the real jumps. They should estimate how far they can jump. Then, they jump and record the distance. Each student should jump three times. Students should complete the rest of the sheet.

*Students are encouraged to use calculators to complete the resource sheet.

Closing: Students will use 10 minutes to write in reflection journal. Topic: How did you feel about this activity? Were there any parts of the mathematics that gave you trouble?

Activity Two: The Incredible Edible Fractions

Teacher Preparation:

1. Copy *Serving Up Fractions*, Student Resource Sheet 2, for each student.
2. Make a transparency of Recipe (Teacher Resource Sheet 1).

Anticipatory Set: Ask the students, “Who likes to cook?” Do you think that you use math in cooking? Solicit student responses. Then, read the book, *Eating Fractions* by Bruce McMillan . Briefly discuss why fractions are used in recipes.

Procedures:

1. Place recipe transparency on the overhead. Briefly, go over the recipe. Discuss that this recipe feeds four people. Point out that **yields four servings** means **provides for four people**. Ask them if they could follow this recipe to feed eight people. Discuss with your group. Solicit group responses. Briefly discuss recipe conversion.
2. Inform students that today they will practice converting a recipe. Model this concept (multiplication of whole numbers and fractions) using the recipe transparency and fraction builders. Have students practice by converting one or two ingredients.
3. Distribute *Serving Up Fractions*, Student Resource Sheet 2. Instruct the students to complete this resource sheet by converting the recipe. Use fraction builders to show multiplication of fractions as repeated addition.

Closing: Place a piece of chart paper on the board with the ingredients listed in recipe form. Be sure not to include the measurements. Call on volunteers to insert the missing measurements for the new recipe.

Directions for Making ‘Fraction Fritters’: Melt butter in boiling water, add salt and flour and beat vigorously. Remove from stove as soon as mixture leaves side of pan. Transfer to mixer bowl, and cool slightly. Add eggs, one at a time, beating after each addition. Heat oil to 375°, dip tablespoon first in oil, then in batter and drop batter on paper towels. Roll in granulated sugar and serve hot.

Activity Three: Design A Badge

Teacher Preparation:

1. Make copies of the Student Resource Sheet 3 (Design A Badge) for each student.
2. Provide pattern blocks.

Procedures:

1. Engage the students in a brief review of pattern blocks. Assume that a hexagon is 1 whole (\$1.50), a trapezoid is $\frac{1}{2}$ (\$.75), a rhombus is $\frac{1}{3}$ (\$.50) and a triangle is $\frac{1}{6}$ (\$.25). Discuss the value of each block. The only pattern blocks you need for today’s lesson are the hexagon, trapezoid, blue rhombus, and triangle.
2. Students will complete the Design A Badge activity.

Closing: Students can share their badges with the rest of the class. They will discuss the price of their badges. They will also discuss how they found the price.

Performance Assessment:

In the performance assessment students will use their knowledge of converting fractions to decimals, adding/subtracting fractions, multiplying decimals (money) and writing about math to complete the last tasks to earn their badges (Student Resource Sheets 4-8). The students will also access prior knowledge of organizing data (graphing) in this assessment. A scoring rubric is included on Teacher Resource Sheets 2 and 3.

Extension/Follow Up:

- Create a bulletin board that is divided equally with students’ names at the top of each section. Make badges for each activity. As the students complete each task, they will receive the badge and add it to the bulletin board. You may even have a parent volunteer make sashes for the badges.

- Read *Math Curse* by Jon Scieska. This book is another great example of how math relates to everyday life.
- Life Science- Students could plant a garden at the school (principal permission).
- Have students find other real life situations/activities that incorporate fractions. They will represent this visually (Art Connection)

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Long Jump



Jump One

Name	Estimated Distance	Distance in fractions	Distance in decimals

Jump Two

Name	Estimated Distance	Distance in fractions	Distance in decimals

Jump Three

Name	Estimated Distance	Distance in fractions	Distance in decimals

*Use data from the decimal column to complete the following task:

1. Calculate the mean distance you jumped. Then, calculate the mean distance your partner jumped.

2a. On the average, who jumped the farthest?_____ What is the difference between the two distances?_____

2b. Explain how you found the answer to 2a. _____

Serving Up Fractions

Directions: The recipe below yields four servings. You need to prepare the recipe for twenty-four people. Convert the recipe so that it will feed everyone.

Fraction Fritters

Ingredients:

$\frac{1}{2}$ cup butter or margarine

1 cup water

$\frac{1}{4}$ tsp. salt

1 $\frac{3}{4}$ cup all-purpose flour

4 eggs

4 cups vegetable oil

Granulated sugar

Now, convert this recipe so that it yields 24 servings.

Chip Off The Old Block Cookies

Ingredients:

1/2 cup butter

1 egg

1/2 tsp. baking soda

2 cups chocolate chips

3/4 cup light brown sugar

1 1/2 tsp. vanilla

1 3/4 cups flour

1/3 cup chopped walnuts

yields four servings

Design a Badge

A. Directions: The committee wants to have a new cooking badge for next year. They are asking all scouts this year to help by designing a badge. Use the pattern blocks to create your design. The only shapes you may use are the hexagon, trapezoid, blue rhombus, and triangle. Now, design your badge. Trace the shapes below.

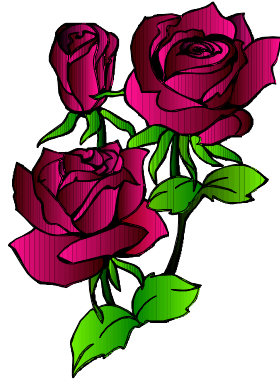
B. The program director spilled coffee on the price list. The only visible part is the price for the blue rhombus. Using this information, find the missing prices.

Price List

Pattern Block	Price
Hexagon	
Trapezoid	
Blue Rhombus	\$.50
Triangle	

What is the total cost of your badge?_____

Hi Ho A Dair-e-o! A Gardening We Will Go!
(Performance Assessment)



Congratulations! You are almost there. After earning this last badge, you will graduate from level four to level five.

Now, on to the last task. You and a committee are to plant a garden in a community in the Northern part of town. The committee has elected you as the delegate and leader. Your job is to make the final decisions.

A. Last week, the committee brainstormed a list of flowers they would like to plant in the garden. Then, they surveyed 100 people in that community to find out their favorite flowers. The results are listed below. Write fractions showing the relative frequency for each result. Then, convert each fraction into a decimal.

Favorite Flowers

Flower	Number of Votes	Fraction	Decimal
Roses	30		
Violets	10		
Impatiens	4		
Tulips	8		
Lilies	16		
Marigolds	8		
Black-Eyed Susans	16		
Geraniums	7		

A. Below, construct a graph to reflect the data from the chart.

A.1 Use the data to decide which four flowers to purchase.

- B. Your next job is to purchase flowers. You can only choose four kinds of flowers to plant. The committee decided on roses, violets, tulips, and black-eyed susans.

Committee's Choices

Flowers	Number of Units Needed
Roses	10
Violets	6
Tulips	8
Black-Eyed Susans	8

The committee researched flower shops in town. They narrowed the choices to two shops. Below are the prices for both shops. Using your knowledge of decimals and money, determine from which shop you will purchase your flowers. Remember, you may buy flowers from only one shop. You may NOT mix and match shops. You have a spending budget of \$450.00.

Dee Knom's Flowers

Price per unit

Roses - \$19.98
 Tulips - \$10.98
 Violets - \$14.98
 Black-Eyed Susan- \$12.98

Eeknator's Floral & Gift Shop

Price per **two** units

Roses - \$35.00
 Tulips - \$23.00
 Violets - \$28.50
 Black-Eyed Susan - \$23.00

C.1 Complete the table (The use of calculators is encouraged).

Flower Costs

Flowers	Number of Units	Dee Knom's	Eeknator's
Roses	10		
Tulips	8		
Violets	6		
Black-Eyed Susans	8		
Total	32		

C.2

- From which shop will you purchase your flowers?_____
- What is the difference between the two totals?_____

C.3

Write a number sentence that shows how you found your answer._____

D. The next step is designing the garden. Using a 10x10-grid graph paper to represent the garden, decide where to plant your flowers. Below is a chart that shows how much space each flower will take.

Flower Space		
Flower	Space Needed (# of sq. ft.)	Key
Roses	3 square feet	Red
Violets	2 square feet	Purple
Tulips	1 square foot	Yellow
Black-Eyed Susans	2 square feet	Black

D.1 Use the above information (key, space needed) to place the flowers in the garden (graph paper) by coloring the square units.

D.2 Find the fractional part of the garden used for each type of flower.

Flower	Fraction
Roses	
Violets	
Tulips	
Black-Eyed Susans	

How much space remains to build paths, fountains, etc.? Write a number sentence to show how you found this answer.

E. Writing Prompt

Wow! The gardening is now complete. Everything turned out beautifully. It is a sight to behold. Now, the project director thought it would be great if you wrote a letter to the mayor informing him of the project and the role you and the committee played in the planning and execution of it.

Before you begin to write, think about the goal of the project, how you determined the favorite flowers, how you decided which flowers to plant, and what factors helped you to choose the best flower shop. Be sure to include in your writing the mathematical reasoning behind your decisions. How did you use fractions and decimals to make your final decisions?

Now, write a letter to the mayor informing him of this gardening experience.

Rubric

Activity A

- 2 – Student has 4 or less errors
- 1 – Student has 5 – 8 errors
- 0 – Student has more than 8 errors

Activity B

- 3 – Student has included all elements of a graph (title, x, y axis labels, data represented correctly, name, date).
Student constructed a bar graph.
- 2 – Student is missing 1 –2 elements.
Student constructed a bar graph.
- 1 – Student is missing 3 – 4 elements.
Student constructed a bar graph.
- 0 – Student constructed a graph other than a bar graph.

Activity C

Flower Costs

Flowers	Number of Units	Dee Knom's	Eeknator's
Roses	10	\$199.80	\$165.00
Tulips	8	\$ 87.84	\$ 92.00
Violets	6	\$ 89.88	\$ 85.50
Black-Eyed Susans	8	\$103.36	\$ 92.00
Total	32	\$481.36	\$434.50

C.1

- 2 – Student has 3 or less errors.
- 1 – Student has 4 – 6 errors.
- 0 – Student has more than 6 errors.

- 1 – Student chose the least expensive shop.
- 0- Student did not choose the least expensive shop.

C.3

- 2 – Student correctly subtracted the two totals.
Student wrote the correct number sentence that shows how he found the difference.
- 1 – Student only demonstrated one of the indicators mentioned in “2.”
- 0 – Student demonstrated none of the indicators mentioned in “2.”

Activity E

To receive a 4,

- the writing piece should clearly discuss the four “think abouts” listed in the second paragraph of the prompt
- the student clearly discusses the mathematical reasoning
- the student uses correct math language
- the writing piece should have no more than four grammatical errors (CUPS – Capitalization, Usage, Punctuation, and Spelling)

To receive a 3,

- the student clearly discusses the mathematical reasoning
- the student uses correct math language
- the writing piece discusses three of the “think abouts”
- the writing piece should have no more than 6 grammatical errors (CUPS)

To receive a 2,

- the student discusses the mathematical reasoning; however, it is not fully developed
- the student uses minimal math language
- the writing piece only discusses 2 of the “think abouts”
- the writing piece is not clear
- the writing piece contains 7 – 10 grammatical errors

To receive a 1,

- the student minimally discusses the mathematical reasoning
- the student’s use of math language is deficient
- the writing piece only discusses 1 of the “think abouts”
- the writing piece is not clear or concise
- the writing piece contains more than 10 grammatical errors

To receive a 0, the student made no attempt.